# DNP Project Final Report

# Increasing Colorectal Cancer Screening in the Primary Care Setting

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## Abstract

**Purpose:** The purpose of this project was to implement a change in workflow to increase colorectal cancer (CRC) screening rates and improve Meaningful Use scores in a primary care setting.

**Background and Significance:** CRC is the second leading cause of cancer-related deaths in the United States among men and women. Current CRC screening rates remain low, even with advanced screening options available. Meaningful Use sets specific objectives for health care providers to achieve. Documenting CRC screening status and recommending CRC screenings to patients is one of the objectives of Meaningful Use and is considered a Clinical Quality Measure (HealthIT.gov). Factors that lead to CRC screening include primary care providers (PCPs) raising the topic, involving support staff, involving patients in the decision-making process, and setting alerts in electronic health records (EHRs).

**Methods:** The Health Belief Model and Ottawa Model of Research Use helped guide this project. The project took place at a private primary care practice. The focus was on patients between the ages of 50 and 75 years old meeting criteria for CRC. Five PCPs and five medical assistants (MAs) chose to participate in the study. Participants were given pre and post Practice Culture Assessment (PCA) surveys to measure perceptions of the practice culture. The project included a three-part practice change: PCP and MA education about CRC screening guidelines, EHR documentation and reminders, and a change of patient visit workflow which included having MAs review patient's CRC screening status before they were seen by the PCP, and handing out CRC screening brochures when appropriate. PCPs then ordered the appropriate CRC screening, and the MA documented the screening in the EHR under a designated location. CRC Screening Project Evaluation Forms were completed by MAs after each patient visit.

**Outcomes:** No significant difference from pre to post survey satisfaction scores were found (*t* (8) = -1.542, p = .162). Means of quantitative data were reported from the CRC screening evaluation forms; N=91. The most common method of screening chosen was colonoscopy, 87%. A strong correlation was found (r (-.293) = .01, p <.05) between receiving a CRC brochure and choosing a form of screening. Meaningful Use scores post intervention were inconclusive as data was not made available by the site.

**Conclusions:** Patients are more likely to choose a screening method when the topic is raised in a primary care setting. Continued staff education on workflow is important to sustain this change. Further research is needed to evaluate cost effectiveness and sustainability of this practice change.

*Keywords:* colorectal cancer, primary care, screening, Meaningful Use

# Increasing Colorectal Cancer Screening in the Primary Care Setting

This paper introduces the topic of colorectal cancer, its prevalence in the Unites States, the importance of cancer screenings, and the ways in which advanced practice nurses can have an impact on its outcomes.

Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States among men and women, even with the current screening options available. Worldwide, CRC is the third most common cancer, affecting approximately 1.4 million people in 2012 (World Cancer Research Fund International, 2017). In 2016, approximately 134,000 people were diagnosed with CRC, accounting for approximately 49,000 deaths (US Preventive Services Task Force [USPSTF], 2016). The USPSTF finds that "screening for colorectal cancer is a substantially underused preventive health strategy in the United States" (US Preventive Services Task Force, 2016). In addition, one of the goals of Healthy People 2020 is to reduce the number of cancer-related deaths through early detection and treatment (Healthypeople.gov, 2017). The USPSTF currently recommends screening for colorectal cancer for both men and women between the ages of 50 to 75 years. Screenings are recommended for patients that are at average risk and who are asymptomatic, meaning no family or personal history of CRC, blood in their stool, iron deficiency anemia, or personal history of irritable bowel disease (IBD) or Crohn's disease (US Preventive Services Task Force, 2016). According to the Colon Cancer Alliance (2017), 50% of new CRC cases occur in people age 50 and older. People with first degree relatives who have had CRC have increased risk, and should be screened earlier. It is recommended that African Americans have their first screening at the age of 45 years.

Current CRC screening rates remain low, even with advanced screening options available. It is estimated that only one in three adults receive some form of CRC screening

between the ages of 50 to 75 years (American Gastroenterological Association, 2017). Colorectal cancer can be caught early with regular screenings. Early detection and treatment leads to better patient outcomes and improved mortality. The USPSTF recently changed its statement on the best way to screen for CRC, stating that any form of screening is better than no screening at all. They do not list screening tests in any order preference, though colonoscopy remains the gold standard (Hite and Margolin, 2016). Available screenings methods include colonoscopy, flexible sigmoidoscopy, computed tomography colonoscopy, the guaiac fecal occult blood test (FOBT), the fecal immunochemical test (FIT), stool DNA test, and the SEPT9 DNA test (US Preventive Services Task Force, 2016). These screening options all have their own unique risks and benefits to their testing. Some can be completed by the patients themselves in the privacy of their home, while endoscopies must be completed in a surgical setting, often with sedation. Overall, CRC is a common cancer affecting millions of people in the United States each year. Multiple guidelines recommend screening for CRC between the ages of 50 to 75 years, and yet screening rates remain low, leading to increased mortality.

## Background and Significance

There are multiple guidelines recommending the routine screening for colorectal cancer (CRC) in people between the ages of 50 to 75 years old. The conventional screening methods include invasive tests, such as endoscopy/colonoscopy, as well as stool tests that are noninvasive. However, there are newer screening options available that have the potential to improve CRC screening rates by offering noninvasive testing in the home setting (Imperiale et al., 2014; Hite & Margolin, 2016; Patel & Kilgore,2015). The U.S. Preventative Services Task Force (USPSTF) (2016) has updated its position statement on routine CRC screenings, stating that any form of CRC is acceptable and better than no CRC screening being done at all. This gives more options

to providers and allows the opportunity to offer noninvasive screening tests in addition to the standard invasive colonoscopy procedure.

Hagoel, Neter, Stein, and Rennert (2016) found that in order to increase CRC screenings, the topic of CRC must be posed by the provider. This sounds simple and even obvious, but it is not always being carried out in practice. If screening options and prompts are not provided by primary care providers routine CRC screening rates will not improve. Primary care providers face many barriers to recommending CRC screenings, including lack of time, logistics, inconvenience, and provider forgetfulness (Spruce and Sanford, 2012). System barriers include lack of health insurance, no reminder systems, lack of time, and no access to colonoscopy (Spruce & Sanford, 2012). Dolan, Boohaker, Allison, and Imperiale (2013) found that patient preference of screening tests is an important factor in deciding which screening test, if any, to complete. Each testing option comes with limitations, risks, and benefits. With colonoscopy, there is risk of post procedure bleeding, rupture, and infection. Colonoscopy also requires a bowel preparation, transportation to and from the testing facility, time away from work, and frequently sedation. These risks should be considered and discussed with patients thoroughly when recommending them for screening (Bibbins-Domingo et al., 2016). Stool based testing, pose less risks, but a risk includes false positive results that can lead to unnecessary follow-up testing (US Preventive Services Task Force, 2016). This method also requires patients to handle their own stool, which could be a deterrent for some. In addition, there is the opportunity for patients to turn in samples from other family members, while claiming it as their own to avoid further testing.

There are multiple studies showing multitarget stool DNA (mt-sDNA) tests having increased sensitivity in detecting CRC compared to fecal immunochemical test (FIT) testing

(Fitzpatrick-Lewis et al., 2016; Imperiale et al., 2014; Malik, 2016). In 2014 the US Food and Drug Administration approved the first mt-sDNA test under the brand name Cologuard. Its use is gaining wide popularity among primary care physicians and is now covered through Medicare. With Medicare offering coverage for this test, it is believed that private insurance companies will soon be covering it as well. Patel & Kilgore (2015) found any form of CRC screening to be more cost effective than having no screening at all, by using incremental cost-effectiveness ratios (ICERs). The highest ICER was for stool DNA testing every 5 years. However, it is still unclear as to which screening method is most cost effective. Cologuard's sensitivity and specificity in detecting CRC is 92% and 84%. High-sensitivity fecal occult blood test (FOBT) has a sensitivity ranging from 62-79% and a specificity ranging from 87% to 96% (US Preventive Services Task Force, 2016). Overall, the USPSTF acknowledges that there are multiple screening tools available, each with their own advantages. Their overall position statement is "the best screening tests is the one that gets done" (US Preventive Services Task Force, p. 2573, 2016).

There are many factors and barriers that impact people receiving CRC screening during the recommended age range. Many studies have found that a team-based approach involving clinic staff can help increase CRC screening rates (Basch, 2015; Baxter, 2017; Potter et al., 2009). Healthcare professionals are aware of the importance of CRC screenings and the impact it has on people's health. However, CRC screening rates remain low and thousands of people die each year from CRC. Previous successful approaches to this problem include using multiple strategies to increase screenings, involving nonclinical staff, and incorporating a shared decision model with patients so they can make the best-informed decision (Schroy et al., 2016; Potter et al., 2009).

Colorectal cancer is the second leading cause of cancer-related deaths in the United States among men and women, even with the current screening options available. Worldwide, CRC is the third most common cancer, affecting approximately 1.4 million people in 2012 (World Cancer Research Fund International, 2017). In 2016, approximately 134,000 people were diagnosed with CRC, accounting for approximately 49,000 deaths (USPSTF, 2016). The USPSTF finds that "screening for colorectal cancer is a substantially underused preventive health strategy in the United States" (USPSTF, 2016). In addition, one of the goals of Healthy People 2020 is to reduce the number of cancer-related deaths through early detection and treatment (Healthypeople.gov, 2017). The USPSTF currently recommends screening for colorectal cancer for both men and women between the ages of 50 to 75 years. Preventative screenings are recommended for patients that are at average risk and who are asymptomatic, meaning no family or personal history of CRC, blood in their stool, iron deficiency anemia, or personal history of irritable bowel disease (IBD) or Crohn's disease (USPSTF, 2016). According to the Colon Cancer Alliance (2017), 50% of new CRC cases occur in people age 50 and older. People with first degree relatives who have had CRC have increased risk and should be screened earlier. It is recommended that African Americans have their first screening at the age of 45 years.

Current CRC screening rates remain low, even with advanced screening options available. It is estimated that only one in three adults receive some form of CRC screening between the ages of 50 to 75 years (American Gastroenterological Association, 2017). Colorectal cancer can be caught early with regular screenings. Early detection and treatment leads to better patient outcomes and decreased mortality. Multiple guidelines recommend the first screening for CRC between the ages of 50 to 75 years. Follow up screenings after initial screenings vary based off findings from the first colonoscopy and family history.

## Problem Statement & Picot

In a primary care setting in the Southwest United States, CRC screening recommendations are being offered at annual visits by primary care providers, if a patient present with symptoms, or if the patient brings up the topic. There is no unified or team approach to CRC screenings. There is also a lack of follow up by primary care providers after the recommendations are given. Often the provider's only way of knowing if the CRC screening was completed is when a report is sent by the gastroenterologist after the visit. This places the responsibility of completing the screening on the patient alone. This assessment has led to the clinically relevant PICOT question, in patients between the age of 50 and 75 years old requiring screening for colorectal cancer (P), how does offering stool DNA testing and FIT testing in addition to a screening colonoscopy (I), compared to offering a screening colonoscopy alone (C), affect the number of patients completing their colorectal cancer screening (O), over a two-month period (T)?

## Search Strategy

To answer this clinically relevant question, an exhaustive search of the literature was performed. Databases searched included Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and The Cochrane Library.

### CINAHL

The key term *colorectal cancer screening* for a yield of 2,775 citations. Then *methods of colorectal cancer screening* was searched for a yield of 178 papers. Combining these terms with the Boolean connector AND resulted in 169 citations. Then the key search terms *fecal immunochemical, FIT, colonoscopy, flexible sigmoidoscopy, guaiac fecal occult blood test,* and *stool DNA* were searched independently and then combined with the OR connector for a total

yield of 8276 papers. The terms *primary care* were then searched independently and then combined for a total of 85,436 citations. When all major concepts were then combined, there was a total yield of 427 citations. Further limitations included studies completed in the United States or Canada only, adult populations age 50-75 years old and studies completed between 2009-2017 for a yield of 66 studies. Rapid critical appraisals were performed using a standardized checklist form on these remaining studies with 7 being retained for further evaluation.

**PubMed**

Initial search phrase using PubMed included *colorectal cancer screening, stool DNA,* and *FIT* for a yield of 32 results. Additional criteria of studies between the year 2009-2017 were added to yield 30 results. Limiting studies to clinical trials only yielded 2 results, therefore the limitation was removed for a total of 30 studies. The terms *primary care* and *practitioner* were searched independently within these studies. After a rapid critical appraisal two were retained for further evaluation.

**The Cochrane Library**

Lastly, a search using The Cochrane Library was performed with key terms *colorectal cancer screening* which had an initial yield of 1,962 results. Additional key terms were added to include *stool DNA, FIT,* and *primary care.* The term *primary care* yielded too many results at 55, 690 results. Ultimately this term was removed to yield a final of 7 studies.

After rapid critical appraisals, ten studies were retained for further evaluation (Appendix H). These studies were chosen based on their relevance to the PICOT question, their level of evidence, and quality of their study. Those that were excluded were of low quality, poor study design, or were not relevant.

## Evidence Synthesis

The ten chosen studies were further critically evaluated and were entered into an evaluation table (Appendix A) to better allow for synthesis of evidence. The studies include six randomized control trials (RCT), one survey, two systematic review and meta analyses, and one cross sectional study. Varying levels of evidence were included among the studies, six of which were high level I, one level IV, two level V, and one level VI. Large samples sizes were included in all the studies. One study included a large degree of bias due to the funding of the study being the maker of the only stool DNA test available on the market currently. This study was still included due to the high sensitivity and specificity of the test in detecting CRC and its innovative testing capability. All studies included CRC as its main area of focus, with all but three having a positive impact on CRC screening status. All but two studies approached screening for CRC in different ways. There were a wide variety of measurement tools used, likely due to various healthcare settings, resources, and different healthcare systems. Measurements consisted of CRC screening status completion rates, intent to screen, or provider satisfaction with available screening tools. Validity and rate of detection for polyps were included in one study due to the nature of the study in evaluating FIT and stool DNA tests. Two studies evaluated physician's roles and involvement in CRC screening and took this into consideration with their results. Three studies included a multidisciplinary team approach and its effect on CRC screening status. Only one study cited a specific theoretical framework to guide its design.

A high degree of homogeneity was identified with regards to the study population and demographics. This is due to the population most commonly affected by CRC and recommended screening guidelines by the USPSTF. There was moderate heterogeneity regarding populations having health insurance, being an underserved population, and ethnicity. There was a moderate

degree of heterogeneity in regard to interventions implemented, due to the wide variety of CRC screening tools available. While there was high homogeneity regarding outcomes measured, being CRC screening status, some studies also measured physician involvement, support staff involvement, patient reminders, and the use of decision aid tools. The most common CRC screening tools studied were colonoscopy, FIT, and gFOBT. This synthesis of evidence and current CRC screening guidelines supported the PICOT question a provided reasoning for implementing a project change that would increase CRC screening rates (Appendix B).

## Purpose Statement

The purpose of this project was to implement a change in workflow to increase colorectal cancer screening rates and improve Meaningful Use scores in a primary care setting.

Meaningful Use was introduced by the United States government in 2009 as part of the Health Information Technology for Economic and Clinical Health Act (HITECH). The goal of Meaningful Use was to encourage health care providers to adopt electronic health records system to improve the quality, safety, and efficiency of patient care. Meaningful Use sets specific objectives for health care providers and hospitals to achieve to qualify for Centers for Medicare and Medicaid Services Incentive Programs. Documenting colorectal cancer screening status and recommending CRC screenings to patients is one of the objectives of Meaningful Use and is considered a Clinical Quality Measure (HealthIT.gov).

## Evidenced Based Practice Model And Conceptual Framework

The Health Belief Model (HBM) (Appendix C) guided the proposed project design. The HBM was developed in the 1950's and explores why people do not partake in health-screening programs (Ueland, Hornung, and Greenwald, 2006). This model has been used in multiple studies to explore CRC screening uptake. The HBM has six key concepts; perceived

susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Ueland, Hornung, & Greenwald, 2006). The HBM was chosen for this practice change because CRC is considered a preventable cancer if caught early on with CRC screenings. Patient's belief of a perceived threat, CRC, and perceived benefits of screening, can improve outcomes and promote self-efficacy when they decide to have CRC and within the recommended timeframe.

The Ottawa Model of Research Use (Appendix D) was used as the Evidence Based Practice (EBP) to facilitate practice change. The Ottawa Model consists of six steps that are used to guide research into practice (Logan, Harrison, Graham, Dunn, and Bissonnette, 1999). The Ottawa Model is widely used in research and is recognized for its ability to implement EBP. The structured approach of assessing barriers and facilitators, monitoring interventions, and evaluating outcomes was the reason this model was chosen. The Ottawa Model takes the patient, practitioner, and environment into consideration to implement a change in practice, all are important factors when it comes to CRC screening. This model provided a systematic and collaborative approach to adopting changes in the way the practice approaches CRC screening.

## Project Methods

Ten primary care physicians (PCPs) and their medical assistants (MAs) at the designated clinic were offered to participate in this evidence-based practice change project. The participants, primary care providers, DNP student, and medical assistants, were expected to spend approximately 8-10 weeks participating in the practice change, or until up to 300 patients had been offered screening. Ultimately, five PCPs and five MAs chose to participate in this practice change. Project data collection took place between October 2017 and February 2018.

Institutional review board (IRB) approval was received on September 7th, 2017 and granted by Arizona State University. The DNP student then met with PCPs, MAs, and the office manager to begin the project. Information on the project design, goals and purpose of the practice change were discussed with individuals during one-on-one meetings at the clinic site. An information sheet about the project was provided at these one-on-one meetings. The Practice Culture Assessment (PCA) survey (Appendix E) was used to measure perceptions of the practice culture. The PCA is a 22-question tool designed to measures perceptions related to practice function and successful implementation of practice quality improvement; permission to use this survey was granted from one of its authors Dr. Perry Dickinson. The PCA has been used in multiple studies to evaluate workplace change (Dickinson et al., 2015; Jaén et al., 2010). This survey acted as a pre and post survey that was given at the beginning of the project and when the project was finished. The attendance at the educational meeting and completion of the PCA survey was used as consent to participate in the practice change. Participants were given a unique subject ID code to match pre and post surveys; all participants responses remained anonymous.

Once participants were recruited to participate, the practice change began. Medical assistants identified patients that meet criteria for CRC screening based on the education they received during the education meeting and they were instructed to follow a CRC Screening Flowsheet (Appendix H) provided to them. If eligible patients did not have any form of CRC screening documented in their electronic health record (EHR), stated they had not had a screening, or were due for repeat screening, the medical assistant handed patients the CDC Designed Colon Cancer Educational Brochure (Appendix F). After patients left their appointment, the medical assistant filled out a brief DNP project form and circled "Yes" or "No" questions to identify the appropriate course of action and a multiple-choice question that delineated which tests patients

chose most frequently (Appendix G). This CRC Screening Evaluation Form was used for dual purpose, both for standard of care and for this project. No patient identification was present on these Evaluation Forms.

The DNP student was present for the first 2 to 3 weeks of the practice change to answer any questions or concerns the PCPs or medical assistants have. She was also available via email and telephone. This process continued from October 2017 to February 2018. After project completion, PCPs and medical assistants were given the PCA Survey again to evaluate for personal perceptions on practice change.

Meaningful Use scores were provided to the DNP student by the office manager and IT personnel to evaluate for any changes in scoring.

SPSS®23 was used to store and analyze data. The DNP student analyzed data and ran reports with the help of an assigned statistician at Arizona State University (ASU) College of Nursing and Heath Innovation (CONHI). A paired t-test was used to measure pre and post survey data. Means of quantitative data were reported from the CRC screening evaluation forms. Meaningful Use scores pre and post project will be provided by the project site practice administrator. After data analysis, an executive summary was provided to the primary care practice to explain the results of the project and recommendations for further action. $396.36 was spent on this project from the DNP student's personal funding. No outside funding was received for this project.

## Project Results

### Meaningful Use

Meaningful Use scores were expected to improve from October to February, which is when data collection and project implementation took place. Meaningful Use Scores prior to

project implementation were provided to act as a baseline. 1/4/17 to 4/3/17 at 14.9%, 4/4/17 to 7/2/17 at 15.17%, and 7/3/17 to 9/30/17 at 15.58%. The first Meaningful Use scores that were reported during the practice change were from 10/1/17 to 12/29/17 at 15.36%. Scores decreased slightly from October to December, possibly due to the holiday season and increased incidence of acute illness such as flu. Data from January and February 2018 were not able to be obtained due to the practice only receiving reports biannually. Unfortunately, this was not made clear to the DNP student early on so data from these two months will not be obtained. It was hoped that data would have been highest in January and February 2018. Since this information was not provided in time, the practice manager will evaluate 2018 data on her own and provide feedback to the practice on her own terms.

**CRC Screening Evaluation Forms**

A total of 91 patients were screened during the project, N=91. Of those screened, 8% did not meet screening criteria. 67% reported they had already had screening, but documentation was not entered in the clinical decision support system (CDSS) section of the chart; documentation was added by the MAs. This shows that the MAs have the ability to improve Meaningful use scores for the practice simply by following this new workflow. If patients have been screened, but it is not documented in the correct spot in the EHR, data is being missed and Meaningful Use scores cannot improve. Adding documentation to CDSS ensures that Meaningful Use scores are captured when reports are run and ensures that CRC screening status is being charted consistently in the same spot by all providers. 70% of those screened were given a CRC Screening Brochure by the MAs. The most common method of screening chosen was colonoscopy, 87%. 3% chose FIT, 3% chose stool DNA, and 7% did not choose any form of screening. A strong correlation was found between receiving a CRC brochure and choosing a

form of screening. A Pearson correlation coefficient was calculated for the relationship between patient's receiving a brochure and choosing a form of screening. A strong correlation was found (r (-.293) = .01, p <.05) between receiving a CRC brochure and choosing a form of screening. This indicates patients are more likely to choose a screening method when they receive a CRC screening brochure.

**Pre and Post PCA Surveys**

The sample consisted of N=9; 4 (44%) PCPs and 5 (56%) MA's. One survey had to be thrown out due to lack of a corresponding pre-survey. A paired-samples *t* test was calculated to compare the mean pre-survey scores to mean post-survey scores. No significant difference from pre to post survey satisfaction scores were found (*t* (8) = -1.542, p = .162). It was observed that participants were reluctant to complete these surveys due to time and the number of questions involved. Some participants took a few days to return surveys while one took two weeks to return a post-survey. Two participants questioned the surveys, asking how they were relevant to the project.

## Discussion

This change in workflow allowed for staff and patient education regarding CRC. Providers and MAs learned of new documentation techniques that would allow the eClinical Works EHR to capture more data regarding Meaningful Use. While Meaningful Use scores are not back yet for 2018, it is important for staff to document in the same spot, CDSS, for this data to be captured. The practice manager reported that Meaningful Use data is only retrievable twice a year, making it more difficult to monitor this information on a monthly basis. The project champion and physician provider expressed liking the CRC Screening Brochures because they were any easy way to approach the topic. The DNP student discussed with the practice manager

if or where they would like to continue having the brochures available for patients. Patients and providers overwhelmingly chose colonoscopy as the most common method of screening, which research shows as the most common method currently. With the advancement of stool DNA testing, these numbers may change in the future.

Originally the goal was to screen 300 patients at the clinic, however MAs began screening patients less as time went on. When asked how the change in work flow was going, simple answers were given such as "fine" or "most people are screened already". This may have indicated a lack of understanding on the importance of continued screening and the need to raise the topic of CRC screening. Data does not support that most people are screened in this office in spite of the MAs thinking this is the case. With fewer CRC Screening Forms being returned as time progressed, the decision was made to stop the project October with N=91 of patients screened. MAs indicated this project did create extra work for them during their already busy schedule and could be another factor for not reaching the original goal of 300 patients. In reviewing the practice change, the MAs said filling out additional forms to capture data was time consuming for them, and some expressed they "asked but forgot to fill out forms". Time is a constant issue when making any workplace change. If this practice change were to continue, forms and additional paperwork would be removed from the daily tasks. Instead, Meaningful Use data would be the only method to capture uptake of screening patients and documenting in the correct area of CDSS within eClinicalWorks. Many corporate organizations and companies have mandatory compliance with Meaningful Use documentation and is stated so in their organization policy. The fact that this practice is a private organization with no hospital affiliation or larger organization overseeing their documentation process could be another reason for decreased uptake of documentation. If the practice were to make this practice change an

actual policy in their practice, uptake and compliance may increase, making this a sustainable practice change.

Participants had trouble remembering their unique subject ID assigned to them to match pre and post survey data. In the future a simpler ID code should be used to avoid confusion to participants. There was no significance found between pre and post survey data. This could be due to the length of time the providers and MAs have been at the clinic, and their perceived belief that their work flow did not need to change, which is stated in the Ottawa Model of Research Use (Appendix C). Follow up meetings and discussions regarding the importance of capturing Meaningful Use data, how it affects patients and the practice as a whole, could help to facilitate workplace change in the future. If this project were to be repeated a different pre and post survey tool that was shorter in length would have been chosen. A post-survey asking about perceptions of this project change with an open area for comments would have provided useful feedback to see what participants liked or did not like about this project.

## Conclusion

Further follow up is needed to evaluate cost effectiveness and sustainability of this practice change. Data for Meaningful Use is only available biannually and must be requested either by IT or the practice manager. The practice manger mentioned looking into this and working with the newly hired IT staff to see if data can be reported more frequently. This would allow for closer monitoring of this data and provide the practice with a more real-time accurate result of CRC screenings on a monthly basis. The eClinical Works EHR does not automatically report such data, so additional staff resources are required to continue measuring outcomes. It is recommended that IT continue to pull this data, so the practice can have an accurate idea of where they stand in capturing CRC screening Meaningful Use rates. Continued staff education is

recommended to ensure everyone is documenting CRC screening status is the same location in the EHR. Printing of CRC Screening Brochures would need to be calculated into annual budget if the practice wishes to continue making them available for patients. Overall, 91 patients had the topic of CRC screening brought to their attention, which is a great start in the early detection of colorectal cancer. Only five providers in this practice chose to participate in this study. If all providers in the practice implemented this change in work flow it is likely that more patients would get screened on a more consistent basis. This practice is a private practice and does not have to follow any specific policies such as larger organizations do. A set policy on CRC screening and documentation could help to increase CRC screening rates at this clinic if the practice chose to enact such a policy. Having a champion of change among the MAs in addition to the PCPs could also have a positive result on sustaining this change. Ultimately the data shows that receiving a CRC screening brochure likely increase the likelihood of a patient choosing a form of screening, which was the goal of this project.

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# Appendix B

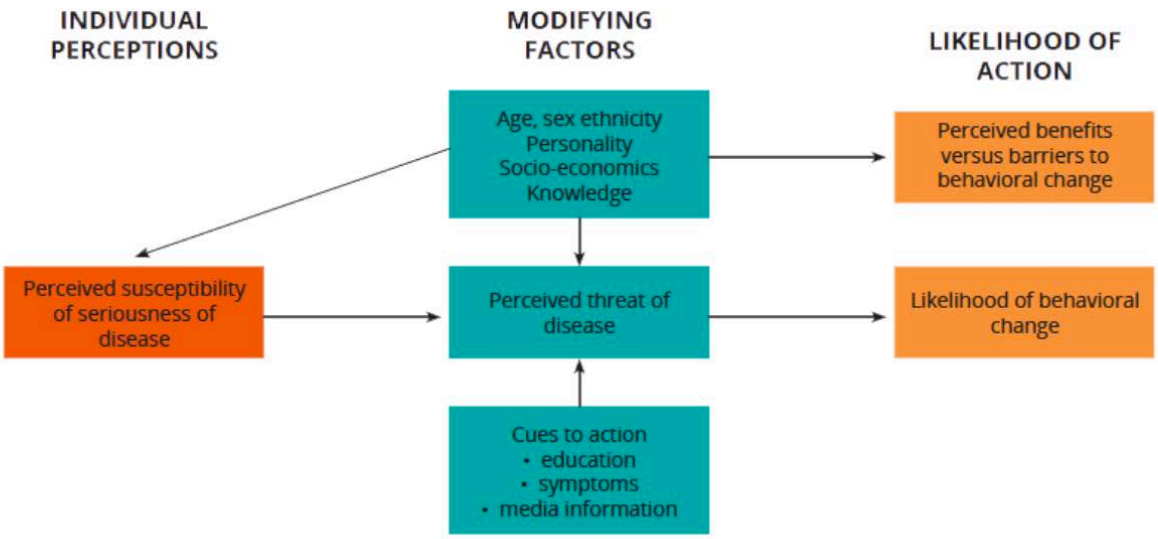
## Synthesis Table

| Author/ Year Level of Evidence | Setting | Population | Screening Methods | | | | | | Patient Preference | PCP Involvement | Team Approach | PT Reminder | Decision Aid Tool | Outcome (CRC Screen Status/ Intent to Screen) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | gFOBT | CT | Stool DNA | FIT | FS | CS | | | | | | |
| Basch (2015) I | P | I | | | | | | X | | | X | X | X | ⇔ |
| Baxter (2017) VI | P | I | | | | | | | | X | X | X | | ⇔ |
| Fitzpatrick (2016) V | P | I U | X* | X | X | X | X* | X | | | | | | ⇑ |
| Gupta (2013) I | P | U | | | | X* | | X | | | | X | | ⇑ |
| Hoffman (2010) I | VA | I | X | | | X* | | | X | | | X | | ⇑ |
| Imperiale (2014) IV | N/A | I | | | X* | X | | X | | | | | | ⇔ |
| Potter (2009) I | P | I/U | X* | | | | | | | | X | X | | ⇑ |
| Schroy (2016) I | P | I | X* | X | X | X | X | X* | X | X | | | X | ⇑ |
| Singal (2016) I | P | U | | | | X* | X | X | X | | | X | | ⇑ |
| Volk (2016) V | P | I/U | X | | | X | X | X | X | | | | X* | ⇑ |

*-Most positive effect on CRC screening uptake or intent to screen, **CRC**-colorectal cancer, **CS**-colonoscopy, **CT**-computed tomography, **FIT**-fecal immunochemical test, **FS**- flexible sigmoidoscopy, **gFOBT**-guaiac fecal occult blood testing, **I**-insured, **U**-underserved population, **P**-primary care, **PCP**-primary care physician, **VA**-Veterans Affair Setting

Appendix C

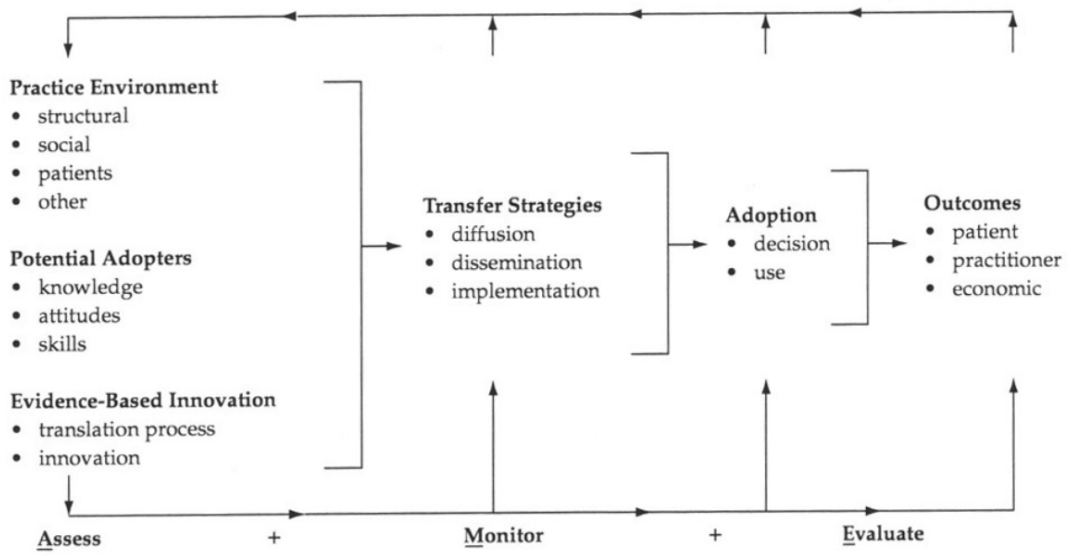
Health Belief Model



Appendix D

Ottawa Model of Research Use

**Figure 1** *The Ottawa Model of Research Use*




From Logan & Graham (1998), p. 229. Copyright © 1998 by Sage Publications. Used with permission.

# Appendix E
# PCA Survey

**Practice Culture Assessment**

***For each of the following questions, please indicate your level of agreement or disagreement with each statement as it applies to this practice by circling your response. Your responses are confidential, and the results of the survey will be reported back to your practice only in a summary form that will not identify you or your responses.***

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| 1. After making a change, we discuss what worked and what didn't. | 1 | 2 | 3 | 4 | 5 |
| 2. My opinion is valued by others in this practice. | 1 | 2 | 3 | 4 | 5 |
| 3. People in this practice understand how their jobs fit into the rest of the practice. | 1 | 2 | 3 | 4 | 5 |
| 4. This practice is almost always in chaos. | 1 | 2 | 3 | 4 | 5 |
| 5. I can rely on the other people in this practice to do their jobs well. | 1 | 2 | 3 | 4 | 5 |
| 6. This practice puts a great deal of effort into improving the quality of care | 1 | 2 | 3 | 4 | 5 |
| 7. This practice encourages everybody's input for making changes. | 1 | 2 | 3 | 4 | 5 |
| 8. We regularly take time to consider ways to improve how we do things. | 1 | 2 | 3 | 4 | 5 |
| 9. The practice leadership makes sure that we have the time and space necessary to discuss changes to improve care. | 1 | 2 | 3 | 4 | 5 |
| 10. This practice is very disorganized. | 1 | 2 | 3 | 4 | 5 |
| 11. When there is conflict or tension in this practice, those involved are encouraged to talk about it. | 1 | 2 | 3 | 4 | 5 |
| 12. People in this practice are thoughtful about how they do their jobs. | 1 | 2 | 3 | 4 | 5 |
| 13. This practice uses data and information to improve the work of the practice. | 1 | 2 | 3 | 4 | 5 |
| 14. Our practice encourages people to share their ideas about how to improve things. | 1 | 2 | 3 | 4 | 5 |
| 15. People in this practice pay attention to how their actions affect others in the practice. | 1 | 2 | 3 | 4 | 5 |
| 16. The leadership in this practice is available to discuss work related problems. | 1 | 2 | 3 | 4 | 5 |
| 17. When we experience a problem in the practice we make a serious effort to figure out what's really going on. | 1 | 2 | 3 | 4 | 5 |

1

**Date:_____ Subject ID:_____**

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| 18. Our practice has recently been very stable. | 1 | 2 | 3 | 4 | 5 |
| 19. Things have been changing so fast in our practice that it is hard to keep up with what is going on. | 1 | 2 | 3 | 4 | 5 |
| 20. The leadership of this practice is good at helping us to make sense of problems or difficult situations. | 1 | 2 | 3 | 4 | 5 |
| 21. Most of the people who work in our practice seem to enjoy their work. | 1 | 2 | 3 | 4 | 5 |
| 22. The practice leadership promotes an environment that is an enjoyable place to work. | 1 | 2 | 3 | 4 | 5 |

**Name of your practice**: _____

**Your position in the practice** ***(check or circle best response)***:

____ Clinician ____Nursing staff ____Front office staff ____ Other

# Appendix F

## CRC Screening Brochure

WHICH TEST IS RIGHT FOR YOU?

COLORECTAL CANCER SCREENING SAVES LIVES

There is no single "best test" for any person. Each test has advantages and disadvantages. Talk to your doctor about which test or tests are right for you, and how often you should be screened.

**RESOURCES**

For more information:
Visit **www.cdc.gov/screenforlife**
Call 1-800-CDC-INFO (1-800-232-4636)
For TTY, call 1-888-232-6348

Colorectal cancer is the second leading cancer killer—but it doesn't have to be.

Screen for life National Colorectal Cancer Action Campaign

CDC U.S. Department of Health and Human Services Centers for Disease Control and Prevention

CDC Publication #99-6948. Revised April 2017

BOTH MEN AND WOMEN ARE AT RISK FOR COLORECTAL CANCER.

**SCREENING SAVES LIVES**

Among cancers that affect both men and women, colorectal cancer is the 2nd leading cancer killer in the U.S. But it doesn't have to be. There is strong scientific evidence that screening for colorectal cancer beginning at age 50 saves lives!

**WHAT IS COLORECTAL CANCER?**

Cancer is a disease in which cells in the body grow out of control. Cancer is always named for the part of the body where it starts, even if it spreads to other parts of the body later. Colorectal cancer is cancer that occurs in the colon or rectum. The colon is the large intestine or large bowel. The rectum is the passageway that connects the colon to the anus.






If you're 50 or older, getting a colorectal cancer screening test could save your life.

HERE'S HOW:

- Colorectal cancer usually starts from precancerous polyps (abnormal growths) in the colon or rectum. A polyp is a growth that shouldn't be there.
- Over time, some polyps can turn into cancer.
- Screening tests can find precancerous polyps, so they can be removed before they turn into cancer.
- Screening tests can also find colorectal cancer early, when treatment works best.




**WHO GETS COLORECTAL CANCER?**

Colorectal cancer occurs most often in people aged 50 years or older. The risk increases with age. Both men and women can get colorectal cancer. If you are 50 or older, talk to your doctor about getting screened.

**AM I AT INCREASED RISK?**

Your risk for colorectal cancer may be higher than average if:

- You or a close relative have had colorectal polyps or colorectal cancer.
- You have inflammatory bowel disease, Crohn's disease, or ulcerative colitis.
- You have a genetic syndrome such as familial adenomatous polyposis (FAP) or hereditary non-polyposis colorectal cancer.

If you think you may be at increased risk for colorectal cancer, speak with your doctor about when to start screening, which test is right for you, and how often you should be tested.

**WHAT ARE THE SYMPTOMS OF COLORECTAL CANCER?**

People who have polyps or colorectal cancer don't always have symptoms, especially at first. Someone could have polyps or colorectal cancer and not know it.

If there are symptoms, they may include:

- Blood in or on your stool (bowel movement).
- Pains, aches, or cramps in your stomach that don't go away.
- Losing weight and you don't know why.

If you have any of these symptoms, talk to your doctor. They may be caused by something other than cancer. However, the only way to know what is causing them is to see your doctor.

**FREE OR LOW-COST SCREENING**

Colorectal cancer screening tests may be covered by your health insurance policy without a deductible or co-pay. Check with your plan to find out which tests are covered for you.

Where feasible, some states in CDC's Colorectal Cancer Control Program provide free or low-cost screenings to those who are eligible. To learn more, visit **www.cdc.gov/cancer/crccp/contact.htm** or call **1-800-CDC-INFO** (1-800-232-4636).

TYPES OF SCREENING TESTS

The U.S. Preventive Services Task Force recommends that adults aged 50–75 be screened for colorectal cancer. The decision to be screened after age 75 should be made on an individual basis. If you are aged 76-85, ask your doctor if you should be screened.

Several different screening tests can be used to find polyps or colorectal cancer. They include:

**Stool Tests**

There are two types of FOBT tests. ***Guaiac-based Fecal Occult Blood Test (gFOBT)*** uses the chemical guaiac to detect blood in stool, while ***Fecal Immunochemical Test (FIT)*** uses antibodies to detect blood in the stool. You receive a test kit from your health care provider. At home, you use a stick or brush to obtain a small amount of stool. You return the test to the doctor or a lab, where stool samples are checked for blood.

The third type of stool test is the ***FIT-DNA test (or Stool DNA test)*** which combines the FIT with a test to detect altered DNA in stool. You collect an entire bowel movement and send it to a lab to be checked for cancer cells.

**How often: gFOBT once a year. FIT once a year. FIT-DNA test once every year or three years.**

**Flexible Sigmoidoscopy (Flex Sig)**

The doctor puts a short, thin, flexible, lighted tube into your rectum, and checks for polyps or cancer inside the rectum and lower third of the colon.

**How often: Every five years, or every 10 years with FIT every year.**

**Colonoscopy**

Similar to flexible sigmoidoscopy, except the doctor uses a longer, thin, flexible, lighted tube to check for polyps or cancer inside the rectum and the entire colon. During the test, the doctor can find and remove most polyps and some cancers. Colonoscopy also is used as a follow-up test if anything unusual is found during one of the other screening tests.

**How often: Every 10 years.**

**CT Colonography (Virtual Colonoscopy)**

Computed tomography (CT) colonography, also called a virtual colonoscopy, uses X-rays and computers to produce images of the entire colon. The images are displayed on a computer screen for the doctor to analyze.

**How often: Every five years.**

COLORECTAL CANCER IS THE SECOND LEADING CANCER KILLER — BUT IT DOESN'T HAVE TO BE.

Appendix G

CRC Screening Evaluation Form

1

Date:_____

**Colorectal Cancer Screening Project Evaluation Form**

***Please circle one:***

| | | |
|---|---|---|
| Met Screening Criteria: | YES | NO |
| Previously Screened, but added documentation to EHR: | YES | NO |
| Received CRC Brochure: | YES | NO |

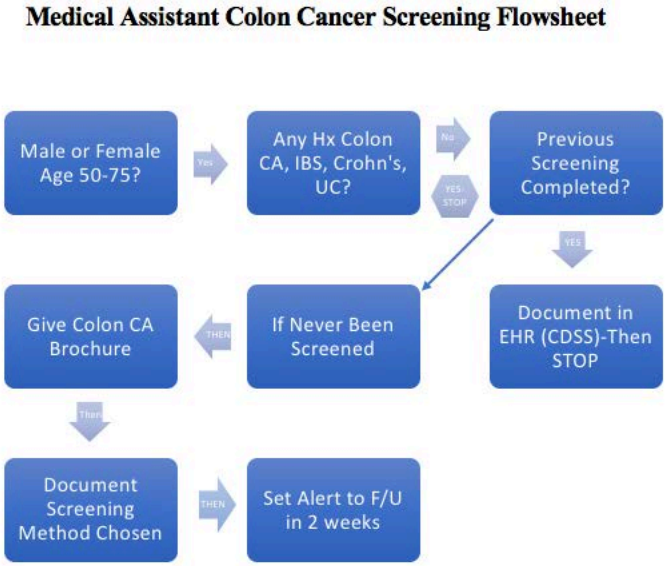
Screening Method Chosen:

| | | | |
|---|---|---|---|
| Colonoscopy | FIT | Stool DNA | None |
| CT | FOBT | | |

Data Entry Data Entry Validation Data Analysis

Appendix H

MA CRC Screening Flowsheet



Appendix A

Evaluation Table: Colorectal Cancer Screening

| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
|---|---|---|---|---|---|---|---|---|
| Basch et al., (2015). A Randomized trial to compare alternative educational interventions to increase colorectal cancer screening in a hard-to-reach urban minority population with health insurance. **Funding:** American Cancer Society Grant: Identifier NCT02392143 **Bias/Conflict:** $20 promised to PTs to complete study USA- NYC | Health Promotion Model- Nola J. Pender | **Design:** RCT<br><br>**Purpose:** To compare interventions to increase CRC screenings in those with health insurance | N= 8792<br>n=564 PTs randomized<br>**Inclusion criteria:** Adults age 50-75 years with health insurance (union-based self-administered and self-insured benefit fund). Currently out of compliance with recommended CRC screening. Having a "regular doctor", a stated intention to remain in the benefit fund for at least 1 year. Reachable by telephone, able to communicate in English, ability to give consent.<br>**Exclusion criteria**: No health insurance. Hx of colorectal polyps, IBD, IBS, Crohn's disease, UC, or current treatment for any type of CA. | **IV 1**: PEM1 Only<br>**IV 2**:AD Only<br>**IV 3**:AD & TTE<br><br>**DV:** CRC screening status<br><br>*PEM1- highlighted colonoscopy as being the only test that can identify & prevent CRC, but explained other CRC screening tests | 3 types data collection: Baseline survey data. Implementation data. Outcome data based on medical claims. | Pairwise group differences using 2x2 $\chi 2$ analyses. Linear trends across groups. | N% screened for CRC:<br>PEM only N=18.3%.<br>AD only N=20%<br>AD&TTE N=25.6%.<br>Total N= 21.5%<br>No statistically significant pairwise differences between groups in screening rate | **Level I**<br>**Strengths:** RCT. TTE based on previously tested model.<br>**Weaknesses:** No theoretical framework named. Poor follow up with participants after 1 year. NYC already has high rate of CRC screening in the country.<br>**Conclusion:** Screening rate was almost 40% higher in AD&TTE group vs PEM- but was not SS |
| Citation | Theory/ | Design/ | Sample/ Setting | Major | Measurement | Data | Findings/ | Level of |

**ACN**-advanced colorectal neoplasia, **ACNI**-Advanced colorectal neoplasia index, **AD**- academic detailing, **BE**- barium enema, **CA**- cancer, **CAPE**-Client Agency Program Enrollment, **CI**- confidence interval, **CRC**-Colorectal cancer, **CS**-colonoscopy, **CT**- computed tomography, **DA**-decision aid, **DNA**-deoxyribonucleic acid, **DRE**- digital rectal exam, **EMR**- electronic medical record, **FAP**- familial adenomatous polyposis, **FIT**- fecal immunochemical test, **FOBT**-fecal occult blood test, **FS**- flexible sigmoidoscopy, **gFOBT**, guaiac fecal occult blood testing, **HA**- hazard ratio, **HNPCC**- hereditary nonpolyposis colorectal cancer, **IBD**-inflammatory bowel disease, **IBS**- irritable bowel syndrome, **ICES**-Institute for Clinical Evaluation Sciences, **iFOBT**- immunochemical fecal occult blood test, **IPDB**-ICES Physicians' Database, **N**-number of participants, **n**-subset of participants, **NNS**- number needed to screen, **OR**-odds ratio, **OHIP**- Ontario Health Insurance Plan, **PCP**- primary care physician, **PEM1**- printed educational materials, **PEM2**- Patient Enrollment Model, **PT**-patient, **QBE**- question-behavior effect, **QI**-quality improvement, **RCT**-randomized control trial, **RPDB**- Registered Persons Database, **SCOPE**-The Supporting Colorectal Cancer Outcomes through Participatory Enhancements, **SDM**-shared decision making, **SDMP**-satisfaction with decision making process, **SS**-statistically significant, **TTE**-tailored telephone education, **UC**- ulcerative colitis, **UTD**-up to date

| | Conceptual Framework | Method | | Variables & Definitions | / Instrumentation | Analysis | Results | Evidence; Decision for practice/ application to practice |
|---|---|---|---|---|---|---|---|---|
| Baxter et al., (2017). Do primary care provider strategies improve patient participation in colorectal cancer screening?<br><br>**Funding:** Canadian Cancer Society (grant #2011-700803). Cancer Care Ontario & Canadian Institutes of Health Research Foundation Grant (Competition #201509).<br><br>**Bias/Conflict**: None<br>**Setting:** Ontario, Canada | Adaptation Model-Roy | **Design**: Cross-sectional survey<br><br>**Purpose**: To determine the effect of provider strategies to increase screening in a single-payer system. | n=717 PCPs<br>n= 147,834 rostered PTs<br>**Inclusion Criteria:**<br>PCPs: practicing PCPs with a valid unique physician identifier in IPDB. Belong to a PEM2 identified in CAPE.<br>PTs: Receiving comprehensive primary care including CRC from a specific PCP. Eligible for CRC screenings (age 50-74) at any point from 4/1/2012 to 3/31/2013 according to RPDB.<br>**Exclusion Criteria:**<br>PCPs: retired, not complete initial survey, not in Ontario province, main practice not primary care.<br>PTs: Residence not Ontario as of 3/31/2013, no contact with healthcare system within > 6 years prior to 3/21/13, if first OHIP eligibility was later than 3/31/2013, if dx of invasive CRC prior to 4/1/2012. Underwent colonic resection prior to 4/1/2012l, if PT died before 3/31/2013. | **IV1:** Survey to PCP to identify covariates<br><br>**DV**: Time to become up to date with CRC screening status | Mailed surveys.<br><br>Modified Dillman-style multimodal approach.<br><br>Cox proportional hazard models. | SAS statistical software.<br><br>Descriptive Statistics. Regression analyses | Multiple PCP strategies (HR=1.27, 95% CI:1.16-1.39, P<0.0001 for PCPs using 4-5 vs 0-1 strategies). Systematic approach for screening weakly associated with screening uptake (HR=1.14, 95%CI: 1.03-1.26, P=0.04>5 years overdue vs <1 year overdue | **Level VI**<br>**Strengths:** Large study. Strong heterogeneity of PT population.<br>**Weaknesses:** No theoretical framework used. Population based survey. Different types of CRC screenings not explained.<br>**Conclusion:** No single strategy was strongly associated with screening. PCP use of multiple strategies > screening uptake. |

| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
|---|---|---|---|---|---|---|---|---|
| Fitzpatrcik-Lewis et al., (2016). Screening for colorectal cancer: a systematic review and meta-analysis<br><br>**Funding:** Public Health Agency of Canada and the Canadian Institutes of Health Research.<br><br>**Bias/Conflict**: None.<br><br>**Setting:** Ontario, Canada | System's Model-Neuman | **Design:** Systematic review and meta-analysis<br><br>**Purpose:** To evaluate the effectiveness of CRC screening in asymptomatic adults. | 87 Included Studies<br><br>**Inclusion criteria:** Average risk, asymptomatic adults age > 18 years. CRC screening with a CS, CT, colonography, gFOBT, iFOBT, FS, BE, DRE, fecal DNA & other identified tests. Primary care setting a PCP could refer to for colonoscopy, CT and FS testing. RCT with comparison groups of no screening or comparison between tests. Harms: any study.<br>**Exclusion criteria:** High risk adults with FAP, HNPCC, history of IBD, personal history of polyps or CRC; adults with symptoms suggesting underlying CRC or with known genetic mutations associated with increased CRC risk. Case-finding or surveillance tests. | **IV1:** effectiveness of each CRC screening test to reduce CRC-specific mortality, all-cause mortality, or incidence of late-stage CRC<br>**IV2**: Optimal age to start & stop screening<br>**IV3:** Optimal screening interval<br>**IV4:** Benefits of different screening tests<br>**IV5**: Incidence of harm<br>**DV**: CRC screening recommendations | Data extraction completed by one reviewer and verified by a second using standardized forms- all checked by statistician before analysis.<br><br>RCTs appraised using Cochrane Risk of Bias tool & Grade Recommendations Assessment, Development and Evaluation (GRADE) system. | Risk ratios using DerSimonian and Laird random-effects model with inverse variance method.<br><br>Binomial CIs calculated by Wilson score interval method. Review Manager 5.3, STATA 12, and GRADEpro | **IV1**: gFOBT & FS 18% reduction<br>**IV2**: older adults ≥ 60<br>**IV3:** No change between biennial and annual gFOBT screening<br>IV4: gFOBT & FS most benefit<br>**IV5**: FS potential harm<br>**DV**: iFOBT higher sensitivity and specificity | **Level V**<br>**Strengths:** Large review.<br>**Weaknesses:** No consideration of PT preference. No consideration of implementation.<br>**Conclusion:** CRC screening using FOBT and FS is effective for reducing CRC mortality and incidence of late-stage disease |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
| Gupta et al., (2013). Comparative effectiveness of fecal immunochemical test outreach, colonoscopy outreach, and usual care for boosting colorectal cancer screening among the underserved<br>**Funding:** Cancer Prevention and Research Institute of Texas, National Institutes of Health-Grants<br><br>**Bias/Conflict**: None | Health promotion model-Pender. | **Design:** RCT<br><br>**Purpose:** Increase CRC screening-through mailed outreach & FIT offering vs colonoscopy | N=5994<br><br>**Inclusion Criteria**: uninsured PTs not UTD with CRC screening, age 54-64 years, served by the John Pete Smith Health Network, a safety net health system.<br><br>**Exclusion Criteria:** UTD CRC screening status, no address or phone number on file, language other than English or Spanish, history of CRC, IBD, polyps, no recent health system visit, incarceration. | **IV1**: FIT outreach<br>**IV2:** CS outreach<br>**IV3:** Usual care<br>**DV:** CRC screening test within 1 year | SAS PROC PLAN<br><br>CPT codes<br><br>FIT test interpretation by healthy system clinic laboratory | SAS Software<br><br>2-sample *t* test $\chi 2$ or Fisher exact test<br><br>2 primary comparisons, P<.025 SS<br><br>All other comparisons, P<.05 SS | FIT tripled CRC screening rates, CS doubled rates compared with usual care (40.7%, 24.1%, and 12.1%).<br><br>P<.001 | **Level I**<br>**Strengths**: Size of study. Level of evidence.<br>**Weakness:** No theoretical framework noted. Less PTs were randomized to CS outreach overall vs other groups. Uninsured PTs unlikely to get colonoscopy regardless due to lack of payment method.<br>**Conclusion:** FIT > vs CS. No |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Setting:** USA- Texas | | | | | | | | intervention results in overall less CRC screening |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
| Hoffman et al., (2010). Comparative Effectiveness of Multifaceted Outreach to Initiate Colorectal Cancer Screening in Community Health Centers.<br>**Bias/Conflict:** None<br>**Funding:** Department of Veterans Affairs (project number SHP 08-177)<br><br>USA | Health promotion model- Pender. | **Design:** RCT<br>**Purpose**: Determine whether CRC screening adherence is greater with FIT or gFOBT | FIT n= 202<br>gFOBT n= 202<br><br>**Setting**: New Mexico Veterans Affairs Health Care System Primary Care Clinic<br><br>**Inclusion:** ICD-9 problem lists, CPT procedure codes, pathology records, and screening reminders to identify primary care PTs age 50-80 years due for CRC screening.<br>**Exclusion:** PTs with CRC, IBD, polyps. | **IV1:** FIT<br>**IV2:** gFOBT<br>**DV:** CRC screening adherence | Random digit number generator (http://www.randomizer.org/) used to assign subjects to receive either FIT or gFOBT.<br><br>FIT tests analyzed on the OC-Auto Micro 80 instrument; human hemoglobin levels N 100 ng/ml were considered +. | -Descriptive statistics with 95% CI.<br>-t-tests or Wilcoxon two-sample test for continuous variables, & chi- square tests for categorical variables.<br>-Multivariate logistic regression modeling to compare adherence | Screening adherence was higher with FIT than gFOBT (61.4% vs. 50.5%, P = 0.03). The adjusted odds ratio for completing FIT vs. gFOBT was 1.56, 95% CI 1.04, 2.32. | **Level I**<br>**Strengths:** Level of evidence, size of study.<br>**Weaknesses:** VA population only. Motivated PTs only consented to study.<br>**Conclusion:** FIT > gFOBT CRC screening status. |
| Citation | Theory/ Conceptual | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentati | Data Analysis | Findings/ Results | Level of Evidence; Decision for |

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| | Frame work | | | | on | | | practice/ application to practice |
| Imperiale et al., (2014). Multitarget stool DNA testing for colorectal-cancer screening<br><br>**Funding:** Exact Sciences; ClinicalTrials.gov number, NCT01397747<br><br>**Bias/Conflict**: Funded by Exact Sciences- maker of the stool DNA test (Cologuard- though not named in study directly) | Health promotion model- Pender. | **Design:** Cross-sectional<br><br>**Purpose:** To evaluate the multitarget stool DNA test as a tool for screening for CRC | N= 9989<br>**Setting:** 90 sites in US & Canada<br>**Inclusion Criteria:** Asymptomatic PTs ages 50-84 years considered average risk for CRC & who were scheduled to undergo screening CS.<br>**Exclusion Criteria:** History of colorectal neoplasia, digestive CA, IBD; had undergone CS within previous 9 years or barium enema, FS within 5 years; positive results of fecal blood testing within 6 months; undergone colorectal resection for any reason other than sigmoid diverticula; rectal bleeding within 30 days; personal or family history of CRC; had participated in any interventional clinical study within 30 days; or unable or unwilling to provide written informed consent. | **IV1**: Multitarget DNA test<br>**IV2**: FIT<br>**DV1**: Sensitivity for detecting CRC<br>**DV2:** Sensitivity for detecting advanced precancerous lesions<br>**DV3:** Rate of detection of polyps | One-sded McNemar paried-comparions tests.<br><br>Hanley-McNeils method to calcuate P values | SAS & StatXact software. | **IV1:** Identified 60 of 65 PTs with CRC; 95% CI<br>**IV2:** FIT identified 48 of 65 CRC; 95%CI<br>**DV1:** 92.3% DNA, 73.8% FIT(P=0.002 ).<br>**DV2:** 42/4% DNA; 23.8% FIT (P=<0.001)<br>**DV3:** 69.2% DNA; 46.2% FIT (P=0.004)<br>NNS: 154 with CS; 166 DNA; 208 FIT. | **Level IV**<br>**Strengths:** Use of additional CRC screening tool now available & shows promise.<br>**Weaknesses:** Has bias. Does not discuss implementation to increase CRC screening rates. Does not discuss PT preferences. What is the cost?<br>**Conclusion:** Stool DNA test has higher sensitivity but lower specificity for CRC detection. |
| Citation | Theory/ Conceptual Frame work | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |

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| Potter et al., (2009). Offering annual fecal occult blood tests at annual flu shot clinics increases CRC screening rates **Funding:** Grants from the American Cancer society, Cancer Control Career Development Award for Primary Care Physicians, and the National Cancer Institute, Asian American Network for Cancer Awareness, Research & Training. **Bias/Conflict**: None.<br><br>USA | General Model of the Determinants of Behavioral Change (a synthesis of behavioral theories) | **Design:** Time RCT<br><br>**Purpose:** To determine whether providing home FOBT kits to eligible PTs during influenza inoculation clinics can contribute to higher CRC screening rates. | N= 514<br>Control n= 246<br>Intervention n= 268<br><br>**Setting:** Flu shot clinic<br><br>**Inclusion Criteria:** PTs age 50-79 years who were mailed flu shot campaign announcements & who attended the 17 flu shot clinic sessions. Had not had a FOBT since the end of prior flu season, a colonoscopy in past 10 years, any previously unevaluated abnormal FOBT results, or history of recent unevaluated rectal bleeding.<br>**Exclusion Criteria:** Did not attend one of the 17 flu shot clinic sessions. | **IV1:** PTs offered flu shots<br>**IV2:** PTs offered flu shots and FOBT kits<br>**DV:** CRC screening status | Flu shot campaign announcements.<br><br>Staff training sessions.<br><br>Colorful multilingual education sheets.<br><br>FOBT kits with postage-paid return envelopes. | Stata software. Pearson $\chi 2$ for categorical variables. 2-sample Wilcoxon test and McNemar test. | Total PTs initially not UTD; Control n= 20.7 % PTs who become UTD Intervention n= 68% PTs who became UTD P <.001<br>Total PTs initially UTD; Control n=90.0%, Intervention n=98%, P<.005 | **Level I**<br>**Strengths:** Strong theoretical framework. Well explained and deigned study.<br>**Weaknesses:** Limited population-only those who attend flu clinics-missing large portion of population.<br>**Conclusion:** FOBT kits during flu season increased CRC rate. Needs to reach a broader population however. Multidisciplinary team approach works. |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
| Schroy et al., (2016). Risk stratification and shared decision making for CRC screening: a randomized controlled trial | Health promotion model-Pender. | **Design:** RCT, unblinded, parallel-group<br><br>**Purpose:** To determine whether risk stratification for ACN | n=352<br>**Setting:** Boston Medical Center-private, not-for-profit community-based academic medical center. Largest safety net hospital in New England.<br>**Inclusion criteria**: Asymptomatic average-risk | **IV1:** Decision aide alone<br>**IV2:** Decision aide plus risk assessment tool<br>**DV1:** Concordance between PT | Electronic risk assessment tool- pre and post-test for PTs.<br>Web-based DVD-formatted decision aid for | SAS software.<br><br>P < 0.05 level | **IV1**: Concordance 88%<br>**IV2**: Concordance 85.6%<br>**DV1**: DA only 88.0; | **Level I**<br><br>**Strengths:** Strong level of evidence. Validated tools used.<br>**Weaknesses:** Unblinded. Single |

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| **Funding:** National Cancer Institute Grant (RO1 CA131197).<br><br>**Bias/Conflict:** None<br><br>USA | | influences provider willingness to comply with PT preferences when selecting a desired CRC screening option | primary care PTs cared for at Boston Medical Center. Age 50-75 years, under care of PCP, and due for CRC screening. **Exclusion criteria**: Lower GI symptoms or iron deficiency anemia, increased risk of CRC for which CS was the preferred screening method, lack of fluency in written & spoken English, comorbidities that precluded CRC by any method | preference & test ordered<br>**DV2**: PT satisfaction with decision-making process.<br>**DV3:** Screening intentions<br>**DV4**: Test completion rates<br>**DV5**: Provider satisfaction<br>**Definition**: Concordance is defined as the number of patients who had their preferred test ordered (n) divided by the total number of patients who preferred the test (N). | physicians- *What Colon Cancer Screening Test is Best for You* - an educational website of the Section of Gastroenterology at Boston University School of Medicine and Boston Medical Center that was created with funding for the Agency for Healthcare Quality and Research.<br><br>ACNI P=0.72-0.93<br><br>Absolute risks assessment scores<br><br>Brief paper-based 3-item survey for providers<br><br>12-item SDMP scale | | DA + ACNI 85.6 P=0.40. DA + ACNI High risk 83.5, DA + ACNI Low Risk 87.1 P=0.51<br>**DV2**: Concordance n= 52.0, Discordance n=48.9, P<0.001<br>**DV3:** Concordance n= 4.6, discordance n=4.0, P<0.001<br>**DV4:** Concordance n= 109, discordance n=7, P=0.004<br>**DV5:** SDM useful P=0.70, SDM will reduce time to decide on CRC screening P=0.10, reduces malpractice risk posttest | institution setting. Lack of provider education for the study. Decision aid tool took between 11-34 minutes- too much time in busy primary care setting<br>**Conclusion:** PT preference an important factor to increase CRC rates. Web-DVD gave PT ALL the options for CRC screening- great web-based tool for education-this gave PTs multiple options for CRC screening |

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| | | | | | (validated) | | n=3.2. SDM positively effects CRC screening rates. | |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
| Singal et al., (2016). Outreach invitations for FIT and Colonoscopy improve colorectal cancer screening rates. **Funding:** National Cancer Institute National Institutes of Health grant. Polymedco Corp. provided FIT test kits **Bias/Conflict**: 1 author a paid member of Scientific Advisory Board for Exact Sciences for work performed outside current study USA | Health promotion model-Pender. | **Design**: Prospective RCT<br><br>**Purpose:** Compare initial screening participation across the 3 groups among individuals with at least 1 year of postintervention follow-up | N=5999 **Setting:** Primary care & hospital **Inclusion Criteria**: PTs age 50-64 years, with at least 1 visit to PCP clinic within the year before randomization, residents of Dallas County, Parkland Health Plus coverage. **Exclusion Criteria**: UPD with CRC screening, no address or telephone number on file, language other than English or Spanish, history of CRC, IBD, polyps, or prior colectomy, incarceration. | **IV1**: Usual care **IV2:** FIT outreach **IV3:** CS outreach<br><br>**DV:** CRC screening status within 12 months | Querying electronic healthy system laboratory data for FIT testing & combination of test orders & administrative claims data for FS or CS | Pearson chi-square test<br><br>SAS statistical software<br><br>alpha .05 | **IV1**: Screening rates 29.6% **IV2**: Screening rate 58.8%. OR 3.39, 95% CI **IV3:** Screening rate 42.4%. OR 1.00, 95%CI | **Level I** **Strengths:** 3-year study. Well designed study.<br><br>**Weaknesses:** Lack of insurance could have skewed CS option<br><br>**Conclusion:** FIT option increases CRC screening most, followed by CS. |

| Citation | Theory/ Conceptual Framework | Design/ Method/Sampling | Sample/ Setting | Major Variables & Definitions | Measurement / Instrumentation | Data Analysis | Findings/ Results | Level of Evidence; Decision for practice/ application to practice |
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| Volk et al., (2016). Patient decision aids for colorectal cancer screening: A systematic review and meta-analysis<br><br>**Funding:** Award #R21CA132669 to Dr. Robert J. Volk form National Cancer Institute.<br><br>**Bias/Conflict**: None.<br><br>USA | Systems Model of Clinical Preventive Care | **Design:** Systematic review and meta-analysis<br><br>**Purpose:** To evaluate the effect of patient decision aids on CRC screening rates | 23 Articles; 21 trials including 11,900 subjects.<br><br>**Inclusion Criteria:** Quantitatively evaluated decision aid comparted to one or more conditions within a pre-post evaluation.<br><br>**Exclusion Criteria:** Not relevant, an intervention that did not include trade-off information, decision aides did not have at least a pre-post design, decision aids did not report primary outcome findings. | Studies evaluating patient decision aids for CRC screening in average-risk adults and their impact on knowledge, screening intentions, and uptake.<br>**IV1:** Received decision aid<br>**IV2:** Received general CRC screening information<br>**DV:** CRC screening rates | Variable per study; individual measurement tools not listed. | Meta-analysis using a standardized form. | PT exposed to DA = greater knowledge (mean difference = 18.3 of 100; 95%CI=15.5, 21.1), more likely to be interested in screening (pooled relative risk = 1.5; 95%CI =1.2, 2.0), & more likely to be screening (pooled relative risk=1.3; 95% CI=1.1,1.4) | **Level V**<br>**Strengths:** Large amount of studies included. 7 CRC screening options included in studies.<br>**Weaknesses:** Multiple types of studies included. Multiple outcome scales used in studies.<br>**Conclusion:** Decision aids associated with greater intentions to be screened & screening uptake |